

A Hilbert scale based integrated gravity & quantum field model

OVERVIEW, DEC 2021

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Prolog

The gravity field theory and the quantum field theory are inconsistent from a physical and from a mathematical modelling perspective. The following provides the December 2021 status of an integrated gravity & quantum field model provided in section „2021 solutions“ in www.fuchs-braun.com. It contains basically a collection from related data being put into context to the proposed mathematical Hilbert scale based model. Thereby, the notion „integration“ has two kinds of meaning, (1) the integration of the incompatible quantum field theory and the gravity field theory, and (2) the integration of the most granular biological/chemical area as an approximation of an underlying physical area, which is also (only) an approximation of the underlying finest mathematical area. The mathematical area is governed by the law of energy conservation, whereby the purely mathematical sub-area is governed by the ground state energy.

The two crucial changes to the current quantum and gravity field theories are

- the replacement of the differentiable manifold concept ^(*) by a geometrical Hilbert space concept
- the replacement of the „all-inclusive“ electron „particle“ ^(**), by elements of the Hilbert space $H_{-1/2}$

^(*) having no physical meaning, while its underlying metric space concept does have no mathematical geometric structure

^(**) a particle, which is a priori „existing“ before a field is acting and which is an element of a distributional Hilbert space, where the regularity of that Hilbert space depends from the space dimension, where the most regular Hilbert space is for space dimension $n = 1$, being still larger than the proposed Hilbert space $H_{-1/2}$. From a physical point of view, an electron particle is equipped with the attribute „charge“ in combination with all relevant attributes enabling particle-field-interactions:

(FeE): „Dirac's theory of radiation is based on a very simple idea; instead of considering an atom and the radiation field with which it interacts as two distinct systems, he treats them as a single system whose energy is the sum of three terms: one representing the energy of the atom, a second representing the electromagnetic energy of the radiation field, and a small term representing the coupling energy of the atom and the radiation field.“

The integration of the biological, physical and mathematical worlds is guaranteed by considering three appropriately defined variational Pseudo-Differential equation representations accompanied with related (energy) Hilbert space domains $H_{1/2}, H_1, H_2$: (1) the finest mathematical $H_{-1/2}$ inner product based layer governed by the conservation law of energy; (2) the physical H_0 inner product based layer governed by the action minimization principle, and (3) the biological/chemical (classical PDE equations) layer probably governed by the fine structure constant including phenomena like forces, cells, virus, the different stati of matter and (according to V. Schauburger) a biological form of motion raising consciousness as it occurs within Schrödinger's *biological potential of living cells*, (ScE).

In the context of a Hamiltonian formalism and the notion „spontaneous symmetry break down“ we recall from (BiJ) p. 48:

„When an exact symmetry of the laws governing a system is not manifest in the state of the system the symmetry is said to be spontaneously broken. Since the symmetry of the laws is not actually broken it would perhaps be better described as „hidden“, but the term „spontaneously broken symmetry“ has stuck.“

The CPT theorem says that any Lorentz invariant quantum field theory must also be invariant under the combined operation of charge conjugation C, parity P, and time reversal T. At the same time, PT in quantum field theory turns particles into anti-particles, (ArF) pp. 639, 646:

Tentative conclusions: Whether a particle has positive or negative charge is determined by the temporal direction in which the four-momentum of particle points. ... the CPT theorem should be called the PT-theorem. It holds for classical and quantum tensor fields theories, fails for classical spinor field theories, but it holds for quantum spinor fields. The fact that it holds for quantum field theories suggests that space-time has neither a temporal orientation nor a spatial handedness.“

(BrK1) Braun K., A gravity and quantum field model, some royal road markers, April 14, 2021

(BrK2) Braun K., A Hilbert scale based consistent gravity and quantum field model, May 22, 2021

(BrK3) Braun K., A Hilbert space based Mie electricity field theory accompanied by a complementary 0-point energy space, September 15, 2021

Handicaps and opportunities

Electrodynamics, Maxwell equations

Handicap 1: Lacking a common mathematical framework there is a large zoo of elementary particles. The root of the evil is already in place in Maxwell's phenomenological theory of electricity, as the theory cannot hold for the interior of the electron. From the point of view of ordinary theory of electrons one must treat the electron as something given a priori, as a foreign body in the field.

Handicap 2: The concealed motions of the electrons are not taken into account as motions of matter, consequently electricity is not supposed attached to matter in the Maxwell theory. The only way to explain how it is that a piece of matter carries a certain charge is to say this charge is that which simultaneously in the portion of space that is occupied by the matter at the moment under consideration. From this it comes that the charge is not, as in the theory of electrons, an invariant determined by the portion of matter, but is dependent on the way the world has been split up into space and time.

A more general theory of electrodynamics has been proposed by Mie, by which it seems possible to derive the matter from the field. A Hilbert space based adapted Mie model overcomes the push back argument of Mie's theory, which is about the selection of physical relevant solution (the physical world law) out of the infinite numbers of possible Mie solutions.

Supporting data:

[The Mie theory.pdf](#)

Weyl H., "Space, Time, Matter", p. 206 ff.

Gravity and Mach's hypothesis

Regarding Mach's hypothesis we quote from (UnA1) pp. 62,65, 66:

the laws of dynamics could depend only on the motion of masses relatively to each other

the laws of nature are independent to accelerated motion.

The Mach hypothesis is that distant celestial objects must be responsible for masses having gravitational properties. It anticipates Einstein's later comparison of inertial and gravitational mass known as the equivalence principle.

The Mach principle has two different aspects. First, and qualitatively, just as the (Einstein) equivalence of principle, it says that inertia and gravitational mass are mysteriously connected. Secondly, Mach also claimed that inertia (i.e. the resistance to acceleration) must have its origin in the relative acceleration with respect to all other masses in the universe. This meant that the strength of gravity was also determined by every other celestial body – and suddenly we have a quantitative statement“.

Supporting data:

Weyl H., "Space, Time, Matter", p. 206 ff.

From z-lib.org :

- The mathematical reality. Why Space and Time are an Illusion by Alexander Unzicker
- Einstein's Lost Key - How We Overlooked the Best Idea of the 20th Century by Alexander Unzicker
- Bankrupting Physics How Today's Top Scientists are Gambling Away Their Credibility by Alexander Unzicker
- The Higgs Fake. How Particle Physics Fooled the Nobel Committee by Alexander Unzicker

Thermal, mechanical or plasma equilibria & turbulence

When a fluid is driven away from thermal or mechanical or plasma equilibrium, it will often undergo a sequence of instabilities, each of which leads to a change in the spatial or temporal structure of the flow. The nature of these instabilities sometimes lead to turbulence. Hydrodynamic turbulence is about a turbulent flow of an incompressible fluid modelled by the NSE.

(BrP): "turbulence studies may be defined as the art of understanding the Navier-Stokes equations without actually solving them ... We can now define turbulence: Turbulence is a three-dimensional time-dependent motion in which vortex stretching causes velocity fluctuations to spread to all wave lengths by the boundary conditions of the flow. It is the usual state of fluid motion except at low Reynolds numbers. ... Another simplification in the study of turbulence is that its general behaviour is apparently unaffected by compressibility if the pressure fluctuations within the turbulence are small compared with the absolute pressure, that is, if the fluctuating Mach number, $u/(speed\ of\ sound)$ say, is small."

Supporting data:

[R. Feynman devoted to hydrodynamics and turbulence](#)

„we very possible already have the equation to a sufficient approximation of an equation for life, the equation of quantum mechanics, ... and ... we have the NSE for a detailed observation and the reconstruction of turbulent flow of an incompressible fluid“ (from this equation for life).

The turbulence of plasma

(TsV) p. 4.:

„Plasma is that state of matter in which the atoms or molecules are found in an ionized state. The interactions of electrons and ions are determined by long-range electrical forces. The many forms of collective motion in a plasma are the result of coupling the charged-particle motion to the electromagnetic field. Therefore, the electromagnetic field which accompanies the particle motion is also a random nonreproducible quantity in a turbulent plasma. Measurements have shown that the fields excited in a plasma during the development of turbulence do in fact have a random nature.“

(CaF) p. 390 ff.:

"The turbulence of plasma differs from the hydrodynamic turbulence by the action of the magnetic field. A more relevant difference is due to the hydrodynamic interaction between the plasma particles, the interaction with the magnetic fields, and the interaction between the electromagnetic waves. ... All of them are the root cause of electromagnetic plasma turbulence. ... The case of interactions between quasi-stationary electromagnetic waves is called weak turbulence. ... The case of non-linear Landau damping (strong plasma turbulence) leads to the generation of virtual waves, which transfer their energy to the affected particles asymptotically with $1/t$; the plasma is heated (turbulence heating) faster than this may happen by purely particles collisions".

The proposed gravity and quantum field model

From a mathematical perspective the proposed gravity and quantum field model is about a variational representation of a Hamiltonian operator with defined domain in an appropriate Hilbert scale framework. The Heisenberg (matter particle) matrices mechanics and the Schrödinger (matter wave) PDE mechanics are equivalent with respect to their common related mapping descriptions of the corresponding Hilbert space based linear operators. However, a linear operator is only well defined in combination with an appropriately defined domain, which differs in case of the Lagrange and the Hamilton formalisms. Paraphrasing Roger Penrose's „*The Emperor's New Mind*“ one might say „*look, the emperor is naked*“.

The common denominator with Heisenberg's mathematical tool set for "*a unified field theory of elementary particles*", (HeW), is about a Hilbert space framework accompanied with an indefinite inner product resp. metric (norm), (HeW). The essential differentiators are

1. there is only one fundamental (Hamiltonian based) conservation law accompanied with two underlying connected „symmetry“ groups, the two components of the complex Lorentz transform
2. the several possible invariants of other fundamental laws (resulting into corresponding observables, which hold unchanged over time during those processes, which are described by those laws) are modelled by an appropriately defined „self-adjoint“ operator, where the operator mapping describes the law, while the operator domain provides the required discrete and continuous spectra, where only discrete spectra become relevant for the (Lagrange formalism governed) physical world.

From a physical perspective the proposed gravity and quantum field model is basically the variational representation of the Hamiltonian built from an enhanced Mie electrodynamics accompanied by the conception of an „electromagnetic pressure“. In this context we note the Nobel Prize awards to W. Lamb & P. Kusch, (1955) for „*the discoveries concerning the fine structure of the hydrogen spectrum*“ & „*the precision determination of the magnetic moment of the electron*“, i.e. there are „a so-called Lamb shift of the Schrödinger equation calculated energy levels“ and "a magnetic moment of an electron".

The Hilbert space based model and point 1 overcomes the main difficulty of the GRT, which is basically caused by a missing truly geometric structure of the underlying manifolds. Regarding the two connected group components of the complex Lorentz transform we note that in order to fulfill the required symmetry of the SRT the wave equation of a relativistic, force-free Dirac particle needs to be of order one with respect to the time and to the space variables. The corresponding Dirac matrix equations are determined by the „rest matrix“ R , the „velocity matrix“ V , the „spin matrix“ S , and the „pseudo-scalar matrix“ T , which links $V = T * S$. The matrices R and T , resp. the matrix S build two groups, where their related matrices are mutually interchangeable; on the other hand within each group they are anti-interchangeable, (MaW).

Supporting data:

- (BrK5) Braun K., A new ground state energy model, August 18, 2013
- (BrK6) Braun K., Comparison table, math. modelling frameworks for SMEP and GUT, May 29, 2017
- (BrK7) Braun K., An alternative Schroedinger (Calderon) momentum operator enabling a quantum gravity model, December 31, 2017
- Riesz operators and rotations
- Legendre transforms
- Einstein A., Ritz W., Zum gegenwärtigen Stand des Strahlungsproblems
- Nitsche J. A., lecture notes, approximation theory in Hilbert scales, extensions and generalizations

An accepted purely quanta field theory

- is based on extended Maxwell-Mie equations, where (positively charged) proton and (negatively charged) electron masses are energetically „balanced / generated“ by Mie’s electromagnetic pressure concept, alternatively to the SMEP ("Standard" (or "Shaky") Model of Elementary Particles) concept of "strong elementary particles interaction". The „beta decay“ process (also called „weak elementary particles interaction“) is when a single neutron decays into a proton, an electron, and an anti-neutrino. The proposed underlying Hilbert space decomposition $H_+ \otimes H_- \otimes H_-$ provides a suitable framework for an integrated model of electromagnetic and "weak elementary particles interactions". In other words, the Maxwell-Mie equations make the Yang-Mills equations obsolete and the related Millennium problem (the YME massgap problem) is solved
- enables corresponding (weak variational) well-posed 3D non-linear, non-stationary Navier-Stokes equations (NSE) accompanied by a non-vanishing, bounded $H_{1/2}$ -energy norm non-linear term as a consequence of the lemma of P. E. Sobolevskii, (see Lemma 3.2 in (GiY), resp. the original proof of P. E. Sobolevskii, (SoP)); we note that the L(2)-based non-linear term (Bu, u) of the NSE vanishes, i.e. it provides no contribution to the energy ("stability") inequality
- provides problem adequate Hilbert space norms for a mathematical proof of the non-linear Landau damping phenomenon. Mathematical speaking the non-linear Landau damping (the strong plasma turbulence case) is a specific behavior of linear waves in plasma governed by the non-linear term of the considered PDE system
- provides a Hilbert space based variational plasma heating model governed by a mathematical Hamilton formalism enabling an approximating (statistical) physical Lagrange formalism governed by the Heisenberg uncertainty inequality, accompanied by approximation theory in Hilbert scales, and supported by related numerical approximation methods, (FEM, BEM)
- enables an (enhanced Mie equation based) enhanced SRT (replacing the GRT) where the Maxwell-Lorentz group with its underlying four *disconnected* components is replaced by the complex Lorentz group with its underlying *two connected* components
- provides a baseline model for a „larger conception of what has to be understood in order to make sense of the natural world. assuming that the intelligibility of the world, as described by the laws that science has uncovered, is itself part of the deepest explanation of why things are as they are“, (NaT) pp. 16, 17.

Regarding the Hilbert space $H_{1/2}$ and its relation to the strong Szegő theorem, to the (bounded mean oscillation) function spaces VMO & BMO, its occurrence in works on topological degree/winding number and on conformal mapping we refer to the references in ((BiN). Regarding the elegant role of $H_{1/2}$ on the S(1) unit sphere in universal Teichmüller theory and its quantization we refer to (NaS), (SeA). $H_{1/2}$ is invariant under the Hilbert transform, and it carries a natural symplectic structure arising from cup product for harmonic forms. It can be identified with the "Hodge-theoretic Jacobi variety" of the unit disc. The Möbius transformations of S^1 act unitarily on $H_{1/2}$, (BiI). Another example motivated by the Ginzburg-Landau model arising in superconductivity is the concept of degree for maps in $H_{1/2}$, playing also an important role in the study of the Ginzburg-Landau vortices, (BoA).

For the relevance of $H_{1/2}$ in aerodynamics we refer to (LiI), (LiI1).

An accepted quantum and gravity field theory also requires a revisit of the „Big Bang Theory“ with its many substantial problems. Khun Dee’s story about „The Implosion Theory of Universe Formation“ provides an alternative approach to the Big Bang explosion theory accompanied by key words like „steps toward thermodynamic & gravitational initiation“, „two movements of mass toward aggregation (gravity) and toward dispersion (thermodynamics)“.

[Dee K., Thermodynamics, gravity and universe creation](#)

Compactly embedded physical macro & micro "realities" into a mathematical "reality"

The conceptual framework of the proposed quanta (dynamics) field model is about two compactly, densely embedded "physical worlds" into an overall "mathematical world"; whereby the two "physical worlds" describe the classical mechanics and the quantum mechanics "world". The two physical "worlds" are concerned with matter particle interactions. The corresponding mathematical models are classical resp. variational representation of 2nd order PDE, governed by the sum of a H(a)-coercive, linear operator with $a = 1/2$ and a non-linear operator. The latter one can be split into a sum of a linearized, compact operator and a "remaining" operator, i.e. the two (physical "world") linear (observable) operators are governed by the Garding inequality. As "physical worlds" approximation solutions are at least elements of the compactly embedded Hilbert space H_1 the prerequisites of the Lax-Milgram theorem are fulfilled ensuring well defined classical or quantum mechanical "physical world" models, (AZA).

From Cantor's *cardinality* perspective accompanied by Lebesgue's integral concept (which is the baseline tool for the probability & statistics theories) the "classical physical world" is a "zero-(sub-) set" of the "physical quanta mechanical world", which is a "zero-(sub-) set" of an overall "mathematical world". The domain inclusions of considered "observable" operators "promote" symmetric operators with a sub-space domain into self-adjoint operators with including domain.

The mathematical model framework is about compactly embedded Hilbert spaces $H_2, H_1, H_{1/2}, H_0, H_{-1/2}, H_{-1}$ allowing e.g. representations in the form $H_{1/2} = H_1 \otimes H_0^\perp$. It enables

- corresponding hierarchies of (variational) PDE models: the solution of a classical PDE of 2nd order is an H_2 -approximation of the underlying (kinematical) variational solution, which is an H_1 -approximation of the underlying (dynamical) variational $H_{1/2}$ solution.

Some views of the world

Thomas Nagel's view of the world

From (NaT) with the sub-title statement "... is almost certainly false", (i.e. the mathematical probability being true is zero), we quote

(NaT) p. 4: *„My target is a comprehensive, speculative world picture that is reached by extrapolation from some of the discoveries of biology, chemistry, and physics – a particular naturalistic Weltanschauung that postulates a hierarchical relation among the subjects of those sciences, and completeness in principle of an extrapolation of everything in the universe through their unification.“*

(NaT) p. 53: *"The existence of consciousness is both one of the most familiar and one of the most astounding things about the world. No conception of the natural order that does not reveal it as something to be expected can aspire even to the outline of completeness. And if physical science, whatever it may have to say about the origin of life, leaves us necessarily in the dark about consciousness, that shows that it cannot provide the basic form of intelligibility for this world. There must be a very different way in which things as they are make sense, and that includes the way the physical world is, since the problem cannot be quarantined in the mind".*

Hans-Peter Dürr's view of the world

(DüH) p. 79: *„Die Wirklichkeit ist ein nicht-auftrennbares, immaterielles Beziehungsgefüge, eine Art „Erwartungsfeld“ für zukünftige mögliche energetisch-materielle Manifestationen. Die Zukunft ist dabei wesentlich offen, was heißen soll, dass sie nicht ganz beliebig offen, sondern durch gewisse allgemeine Bedingungen eingeengt ist, die mit den sogenannten Erhaltungssätzen zusammenhängen und aus Symmetrie-Eigenschaften der Dynamik resultieren. Hierzu gehört insbesondere die Erhaltung der Energie, welche die „Masse“, nach Einstein, als eine konzentrierte Form der Energie einschließt, doch auch die Erhaltung der elektrischen Ladung und anderer. Sie sorgt dafür, dass bei Mittlung im Großen überhaupt Eigenschaften, die Kenngrößen der klassischen Physik, übrig bleiben und greifbar werden.“*

Regarding the special role of mathematics we quote from

(DüH) p. 100: *„Die neu empfohlene Vorstellung: Zuerst „Beziehung“ (relationship), dann Dinge (lat. „res“, e.g. part of the notion "reality") erscheint uns zunächst grotesk, obwohl es eigentlich unsere Grunderfahrung widerspiegelt: Zuerst „erleben“ und dann das „begriffliche Ding“, was wir begreifen. ... Im Gegensatz zu unserer Umgangssprache, die auf Fragen: Was ist? aufbaut und zur Klärung Begriffe und Substantive einführt, ist die Sprache der Mathematik für Fragen nach: Wie? besser geeignet. So etwa: Wie wirkt, wie passiert, wie verbindet etc.? Die Mathematik hat deshalb keine Schwierigkeiten „frei-schwebende“ Beziehungen auszudrücken. Sie führt Symbole ein, die Prozesse charakterisieren.“*

Regarding "gaining knowledge" in quantum physics in dialogue with artist-scientists based on a vision (see also (UnA)) we quote

(DüH) p. 105: *„... wir (W. Heisenberg in dialogue with H.-P. Dürr) haben im Hintergrund eine innerliche Verbundenheit die wir in der Quantenphysik Potentialität nennen. Sie charakterisiert Kann-Möglichkeiten, die erlauben, sich vielfältig, doch nicht beliebig, in der Realität zu manifestieren.“*

Regarding "cooperation" based on the paradigm of the living we quote

(DüH) p. 126: *"Darwin ('s) ... "Survival of the fittest" ... entspricht einer kohärenten, gleichschwingenden Überlagerung verschiedener Wahrscheinlichkeitswellen, die einer kooperativen Integration entsprechen und dadurch - ... - eine Verstärkung erfahren, wobei die Wellenhöhe ein Maß für die Wahrscheinlichkeit der Realisierung bestimmter für uns begreifbarer energetisch-materieller Erscheinungsformen festlegt.“*

Viktor Schauberger's view of the world

Viktor Schauberger's view of the world provides two physical and biological forms of motions with related negative and positive energies; the biological form of motion (which is a centripetal motion corresponding to the negative entropy) raises consciousness as it occurs within the biological potential of living cells, (ScE).

Viktor Schauberger's and Edward Leedskalnin's view of the world

Schauberger's theory of spiral movement was experimentally confirmed by F. Ehrenhaft; in such a magnetic field environment the centripetal force affecting the considered particles was 130-times greater than the affecting gravity. This might provide an alternative approach to explain the **fine structure constant**:

(AIO) with an alternative approach to explain the fine structure constant?

Edward Leedskalnin's view of the world

Edward Leedskalnin's view of the world is about a magnetic current and an electric current as two sides of the same coin. The two currents are made up of individual "North Pole" and "South Pole" particles, where one current runs against the other, both with high velocity in a whirling helical form.

Khun Dee's Story about the universe creation

Khun Dee's story is about „The Implosion Theory of Universe Formation“ providing an alternative approach to the Big Bang explosion theory accompanied by key words like „*steps toward thermodynamic & gravitational initiation*“, and „*two movements of mass toward **aggregation** (gravity) and toward **dispersion** (thermodynamics)*“. The two kinds of movements put the spot on Viktor Schauberger with his two kinds of kinematical energies resp. their related biological force types, centrifugal (linear movements) and centripetal forces :

Dee K., Thermodynamics, gravity and universe creation

Martin Heidegger's view of the world

An indication for the need and validity of a fundamental ontology results for M. Heidegger from the crisis of sciences working on science specific conceptual foundations. His proposed task of a fundamental ontology is a not to be constructed deductively genealogy of the different possible ways of being, (LuA) p. 15. We quote from

(HeM) p. 10: *„All ontology, no matter how rich and tightly knit a system of categories it has at its disposal, remains fundamentally blind and perverts its innermost intent if it has not previously clarified the meaning of being sufficiently and grasped this clarification as its fundamental task.“*

From (HeM1) we quote

(69): *„In metaphysics reflection is accomplished concerning the essence of what is and a decision takes place regarding the essence of truth. Metaphysics grounds an age, in that through a specific interpretation of what is and through a specific comprehension of truth it gives to that age the basis upon which it is essentially formed. This basis holds complete dominion over all the phenomena that distinguish the age. Conversely, in order that there may be an adequate reflection upon these phenomena themselves, the metaphysical basis for them must let itself be apprehended in them. Reflection is the courage to make the truth of our own presuppositions and the realm of our own goals into the things that most deserve to be called in question.“*

(72) *„Modern physics is called mathematical because, in a remarkable way, it makes use of a quite specific mathematics. But it can proceed mathematically in this way only because, in a deeper sense, it is already itself mathematical.“*

(73) *„The rigor of mathematical physical science is exactitude. Here all events, if they are to enter at all into representation as events of nature, must be defined beforehand as spatiotemporal magnitudes of motion. Such defining is accomplished through measuring, with the help of number and calculation. But mathematical research into nature is not exact because it calculates with precision; rather it must calculate in this way because its adherence to its object-sphere has the character of exactitude. The humanistic sciences, in contrast, indeed all the sciences concerned with life, must necessarily be inexact just in order to remain rigorous. A living thing can indeed also be grasped as spatiotemporal magnitude of motion, but then it is no longer apprehended as living. The inexactitude of the historical humanistic sciences is not a deficiency, but is only the fulfillment of a demand essential to this type of research. It is true, also, that the projecting and securing of the object-sphere of the historical sciences is not only of another kind, but is much more difficult of execution than is the achieving of rigor in the exact sciences.“*

The Mie theory

A more general theory of electrodynamics has been proposed by Mie, by which it seems possible to derive the matter from the field.

The requirement leading to the Mie equations is that the mechanical law must follow from the field equations. Therefore, the Mie equation is fully analogous to that of the fundamental law of mechanics. In the static case that is, the electric force is counterbalanced in the ether by the concept of an „*electric pressure*“. It is the essential differentiator to the Lorentz equations, where there is no law that determines how the potentials depend on the phase-quantities of the field and on the electricity; there is only a formula giving the density of the mechanical (*ponderomotorische*) force and the law of mechanics, which governs the motion of electrons under the influence of this force.

Mie's theory resolves the problem of matter into a determination of the expression of the Hamiltonian function in terms of four quantities and the laws for the field may be summarised in a Hamilton's principle.

(WeH): "*G. Mie in 1912 pointed out a way of modifying the Maxwell equations in such a manner that they might possibly solve the problem of matter, by explaining why the field possesses a granular structure and why the knots of energy remain intact in spite of the back-and-forth flux of energy and momentum. The Maxwell equations will not do because they imply that negative charges compressed in an electron explode; ... The preservation of the energy knots must result from the fact that the modified field laws admit only of one state of field equilibrium ... The field laws should thus permit us to compute in advance charges and mass of the electron and the atomic weights of the various chemical elements in existence. And the same fact, rather than contrast of substance and field, would be the reason why we may decompose the energy or inert mass of a compound body (approximately) into the non-resolvable energy of its last elementary constituents and the resolvable energy of their mutual bond. At a certain stage of the development it did not seem preposterous to hope that all physical phenomena could be reduced to a simple universal field law (in the form of a Hamiltonian principle).*"

In mechanics, a definite function of action corresponds to every given mechanical system and has to be deduced from the constitution of the system. Mie's theory is only concerned with a single system, the world. This is where the real problem of matter takes its beginning: to determine the Mie „world-function of action“, belonging to the physical world.

The proposed gravity and quantum field model is basically an enhanced Mie electrodynamic overcoming the above difficulty which is basically caused by a missing truly geometric structure of the underlying manifolds w/o any conceptual relationship to all possible mathematical solutions of the Mie equations. Therefore, the enhancement is concerned with a replacement of the manifold framework by a Hilbert space, where its inner product induces a corresponding norm and where an existing hermitian operator induces a corresponding energy norm, governing for example the least action or least energy formalisms.

The common baseline with the proposed NSE solution in line with the proposed YME solution is related to the physical notion "*pressure*", which has the same unit of measure than a "*potential difference*". The common additional conceptual new element is the fact that a "*potential difference*" becomes now an intrinsic element of the corresponding PDE systems governed by the closed "potential energy" ("ground state", "internal energy") sub-space.

The complex Lorentz group & the CPT theorem

The complex Lorentz group provides the central tool in the proof of the CPT theorem. It says that any Lorentz invariant quantum field theory must also be invariant under the combined operation of charge conjugation C, parity P, and time reversal T, even though none of those individual invariances need hold. Physically speaking the CPT theorem says, that in quantum field theory there is a mathematically proven symmetry of the combined three physical (measurable) attributes of a quantum artefact (i.e. temporal orientation, spatial handedness, and matter–anti-matter transformation). In other words, the CPT theorem (which may be called the PT-theorem, see below) provides a mathematically proven physical law.

(ArF) pp. 639, 646: *"In quantum field theory particle states correspond to „positive frequency“ solutions of the corresponding classical field theory, while anti-particle states correspond to „negative frequency“ solutions. Since PT turns positive frequency solutions into negative frequency solutions, PT in quantum field theory turns particles into anti-particles.*

Tentative conclusions: Whether a particle has positive or negative charge is determined by the temporal direction in which the four-momentum of particle points. ... the CPT theorem should be called the PT-theorem. It holds for classical and quantum tensor fields theories, fails for classical spinor field theories, but it holds for quantum spinor fields. The fact that it holds for quantum field theories suggests that space-time has neither a temporal orientation nor a spatial handedness."

In the context of the CPT symmetry and Lee-Yang's law of parity conservation (Nobel prize 1957) we quote from (UnA2), *"The dance of electrons and light"*:

.... „Long before the symmetry fashion took over, Richard Feynman became famous for his intriguing interpretation of the interactions of electrons, positrons, and light. The basic idea is fairly easy to grasp. Thanks to Heisenberg's uncertainty principle, a traveling electron can borrow for a little time t an amount of energy $E = h/t$. Electrons may use this energy for juggling with photons. Like two people sitting on wheeled office chairs who are throwing heavy medicine balls to one another and rolling backward every time they pitch or catch the ball, two electrons that exchange photons knock each other back, too. Feynman managed to reformulate the laws of electrodynamics—two electrons feel a repulsive force—in these funny terms. The calculations based on this have led to predictions that have been precisely tested and are considered the best-measured results of all physics (The magnetic moment of an electron (its inherent magnetism) and the so-called Lamb shift in the spectral lines of a hydrogen atom). Richard Feynman, Julian Schwinger, and Sin-Itiro Tomonaga were justifiably awarded the Nobel Prize for this in 1965. The big insight of the theory is that light and the most basic particles, electrons and positrons, show such a puzzling similarity. Yet nobody knows the reason for it."

Regarding the approach to extend the concept of complex analyticity to quaternions by considering differential quotients we refer to (KrR).

Extract from

H. Weyl, *Philosophy of Mathematics and Natural Science*, (WeH)Appendix E:
Physics and Biology

topic „virus“

p. 276: *„Incidentally, the gap between organic and inorganic matter has been bridged to a certain extent by the discovery of viruses. Viruses are submicroscopic entities that behave like dead inert matter unless placed in certain living cells. As parasites in these cells, however, they show the fundamental characteristics of life – self-duplication and mutation. On the other hand many viruses have the structure typical of inorganic matter; they are crystals. In size they range from the more complex protein molecules to the smaller bacteria. Chemically they consist of nucleo-protein, as the genus do. A virus is clearly something like a naked gene. The best studied virus, that of tobacco mosaic disease, is a nucleo-protein of high molecular weight consisting of 95 per cent protein and 5 per cent nucleic acid; it crystallizes in long thin needles.“*

p. 277: *„The specific properties of living matter will have to be studied within the general laws valid for all matter; the viewpoint of holism that the theory of life comes first and that one descends from there sort of deprivation to inorganic matter must be rejected. It is therefore significant that certain simple and clearcut traits of wholeness, organization, acausality, are ascribed by quantum mechanics to the elementary constituents of all matter.“*

p. 277: *„The quantum physics of atomic processes will become relevant for biology wherever in the life cycle of an organism a moderate number of atoms exercises a steering effect upon the large scale happenings. On a broad empirical foundation, genetics furnishes the most convincing proof that organisms are controlled by processes of atomic range, where the acausality of quantum mechanics may make itself felt. ... The mere fact of such X-rays induced mutations proves that the genes are physical structures.“*

p. 278: *„By ingenious methods H. J. Muller, N. W. Timoféeff-Ressowsky, and others have succeeded in establishing simple quantitative laws concerning the rate of induced mutations. These results indicate that the mutation is brought about by a single hit, not by the concerted action of several hits, and that this hit consists of an ionization, and is not, as one might have thought, a process directly released by the X-ray photon or absorbing the whole energy of the secondary electron.“*

These facts suggest the hypothesis that a gene is a (nucleo-protein) molecule of highly complicated structure, that a mutation consists in a chemical change of this molecule brought about by the effect of an ionization on the bonding electrons, and that thus allele genes are essentially isometric molecules.“

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Further supporting pdf data in a broader context

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